

Lower Snake and Lower Columbia River Project Operations 2006

Flow, Spill
& %TDG



Ice Harbor Dam



Bonneville Dam



Observed Water Supply And Runoff



Lower Granite Dam



*The
Dalles
Dam*





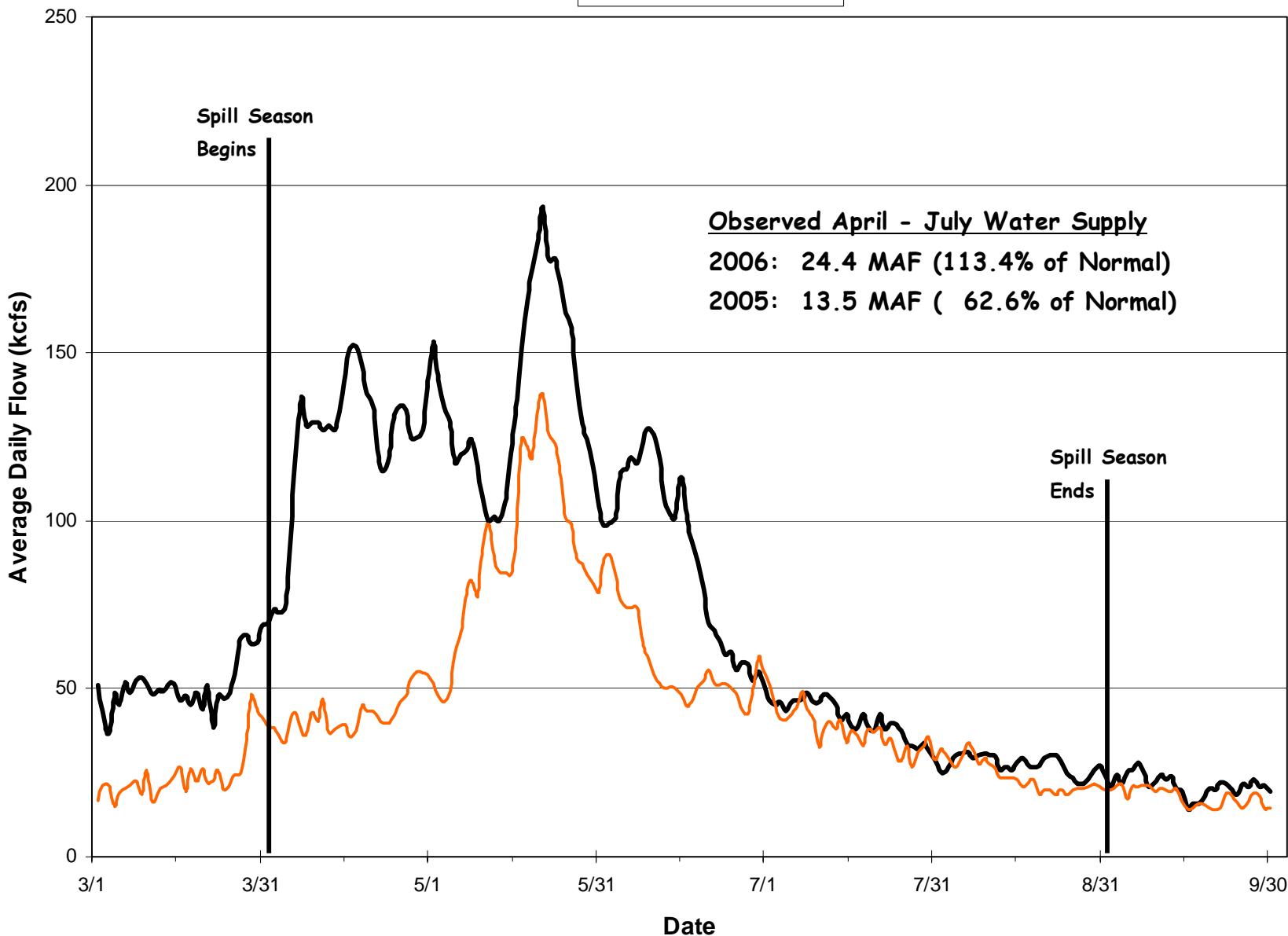
Columbia River Basin



- Corps of Engineers Dams
- Dams Owned by Others
- Bureau of Reclamation Dams

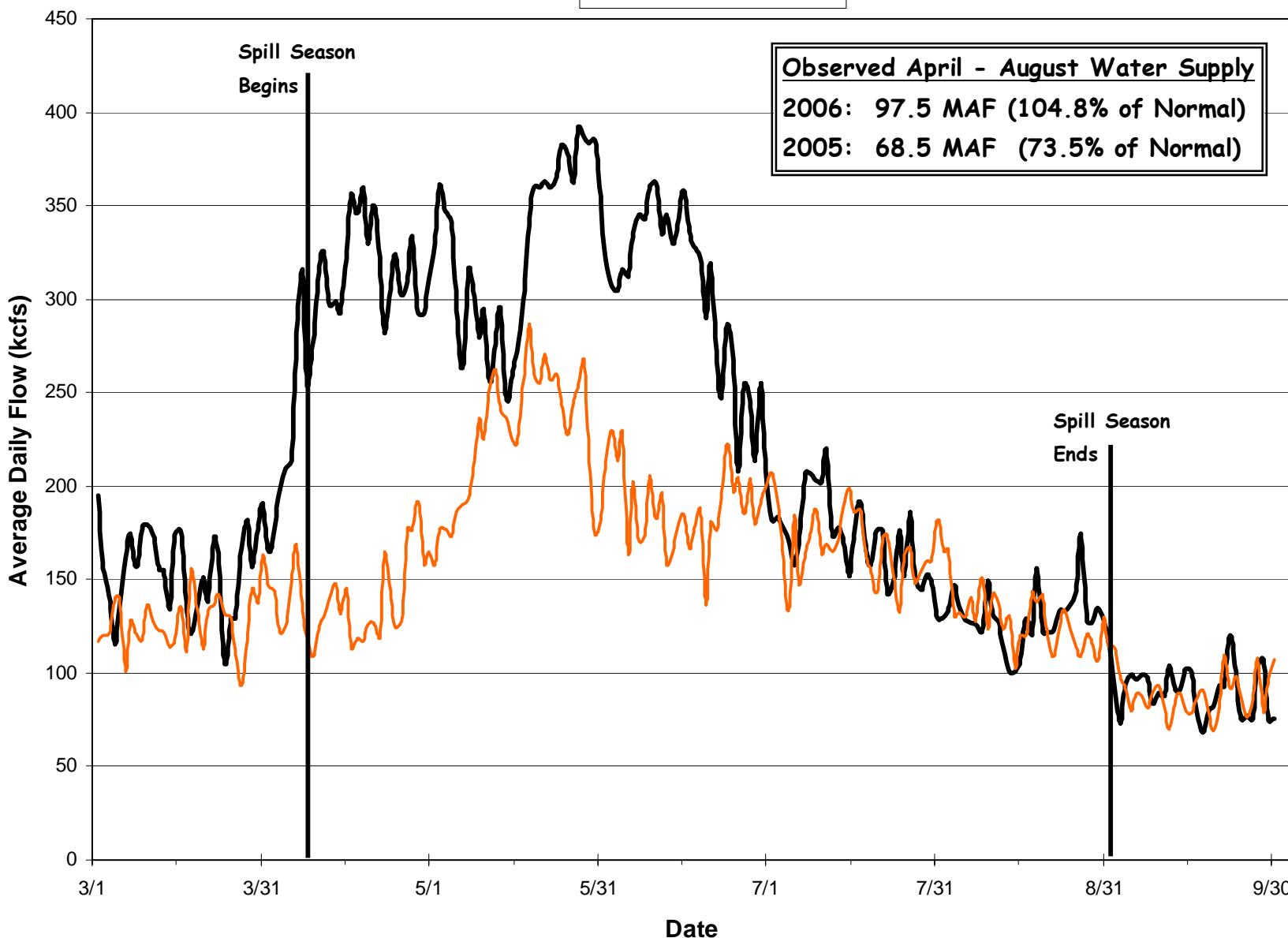
Outflow Discharge - Lower Granite Dam

— 2006 — 2005



Outflow Discharge - The Dalles Dam

— 2006 — 2005





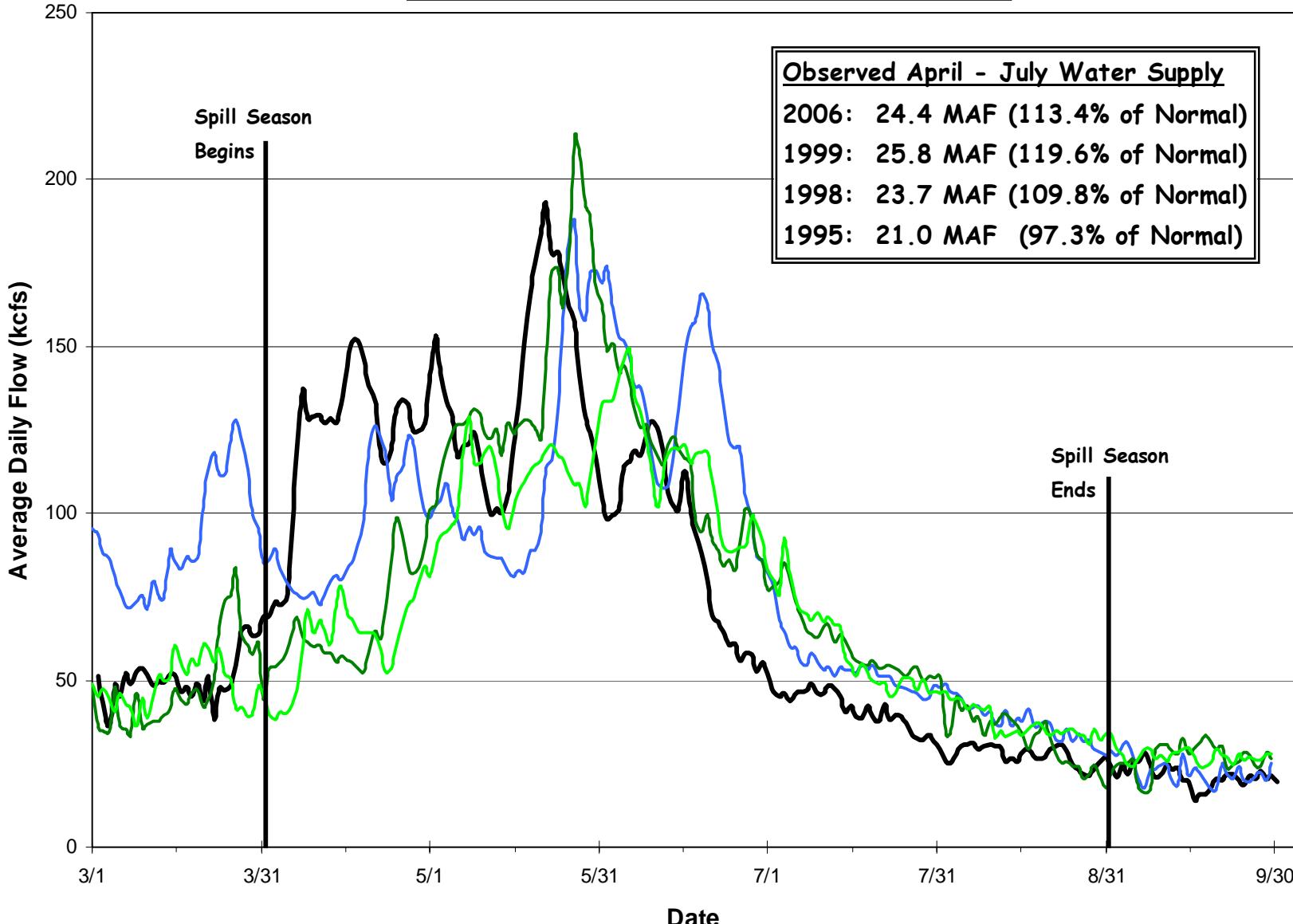
Observed Water Supply Volumes

Year	Lower Granite Dam		The Dalles Dam	
	April – July Runoff MAF	% of Normal	April – August Runoff MAF	% of Normal
1995	20.98	97.32	86.09	92.48
1996	28.11	130.42	111.08	119.33
1997	33.53	155.56	133.13	143.02
1998	23.67	109.82	90.09	96.79
1999	25.78	119.59	110.34	118.53
2000	17.16	79.63	84.27	90.53
2001	10.30	47.78	52.79	56.71
2002	19.02	88.24	93.80	100.77
2003	16.73	77.64	73.77	79.25
2004	15.03	69.71	72.96	78.38
2005	13.49	62.6	68.45	73.54
2006	24.44	113.38	97.54	104.79

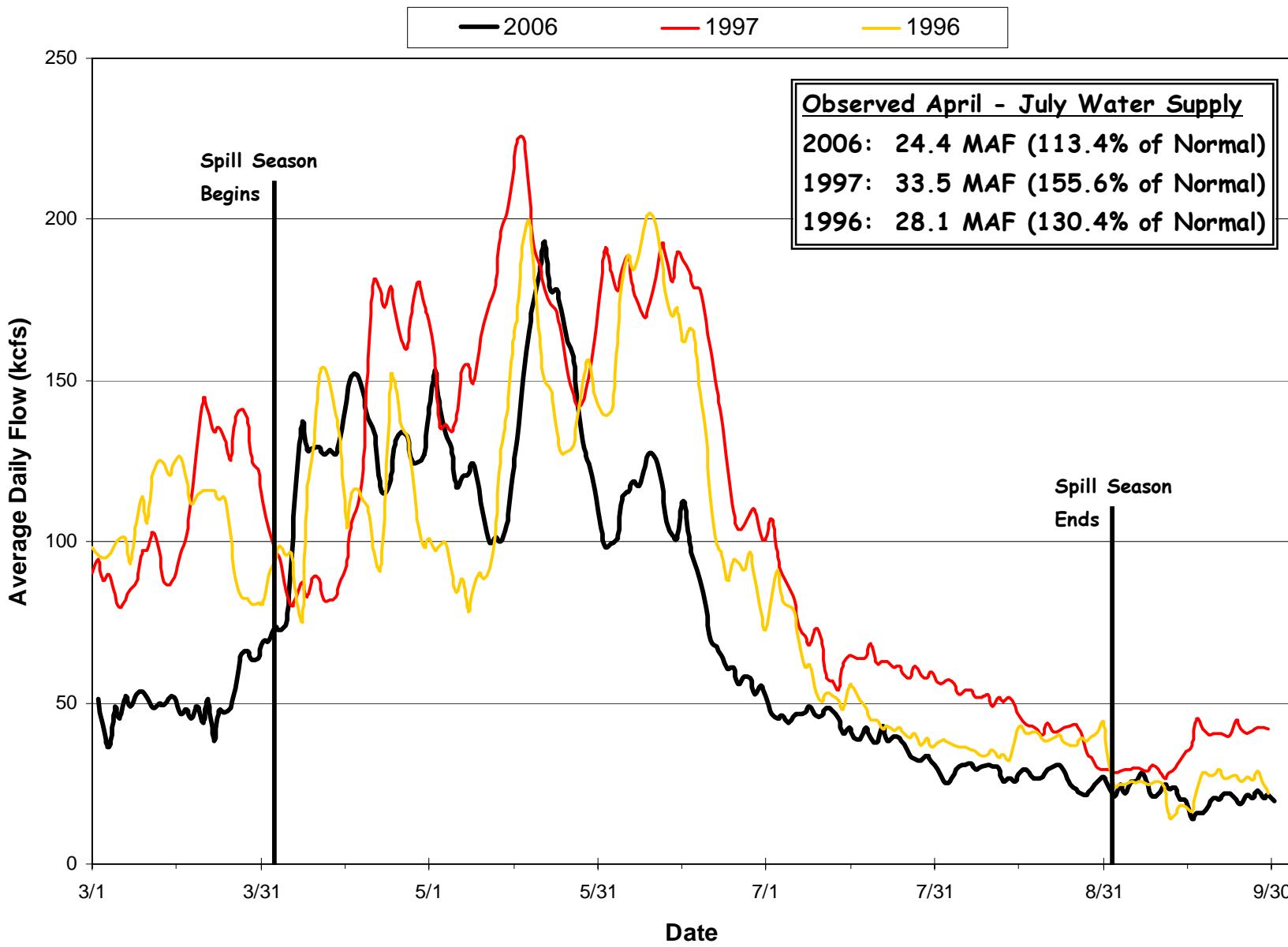
MAF = Million Acre-Feet

Outflow Discharge - Lower Granite Dam

— 2006 — 1999 — 1998 — 1995



Outflow Discharge - Lower Granite Dam



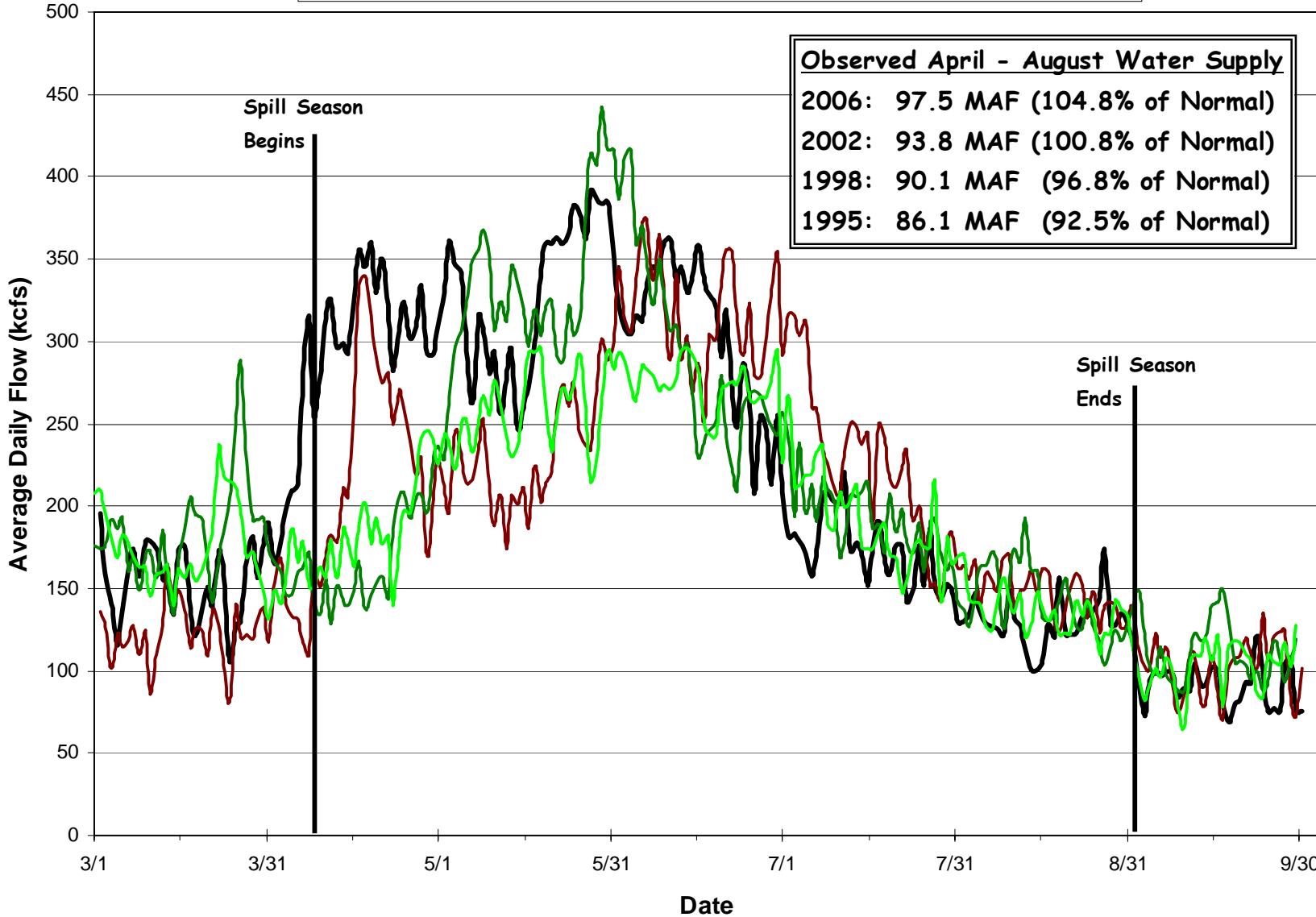
Outflow Discharge - The Dalles Dam

— 2006

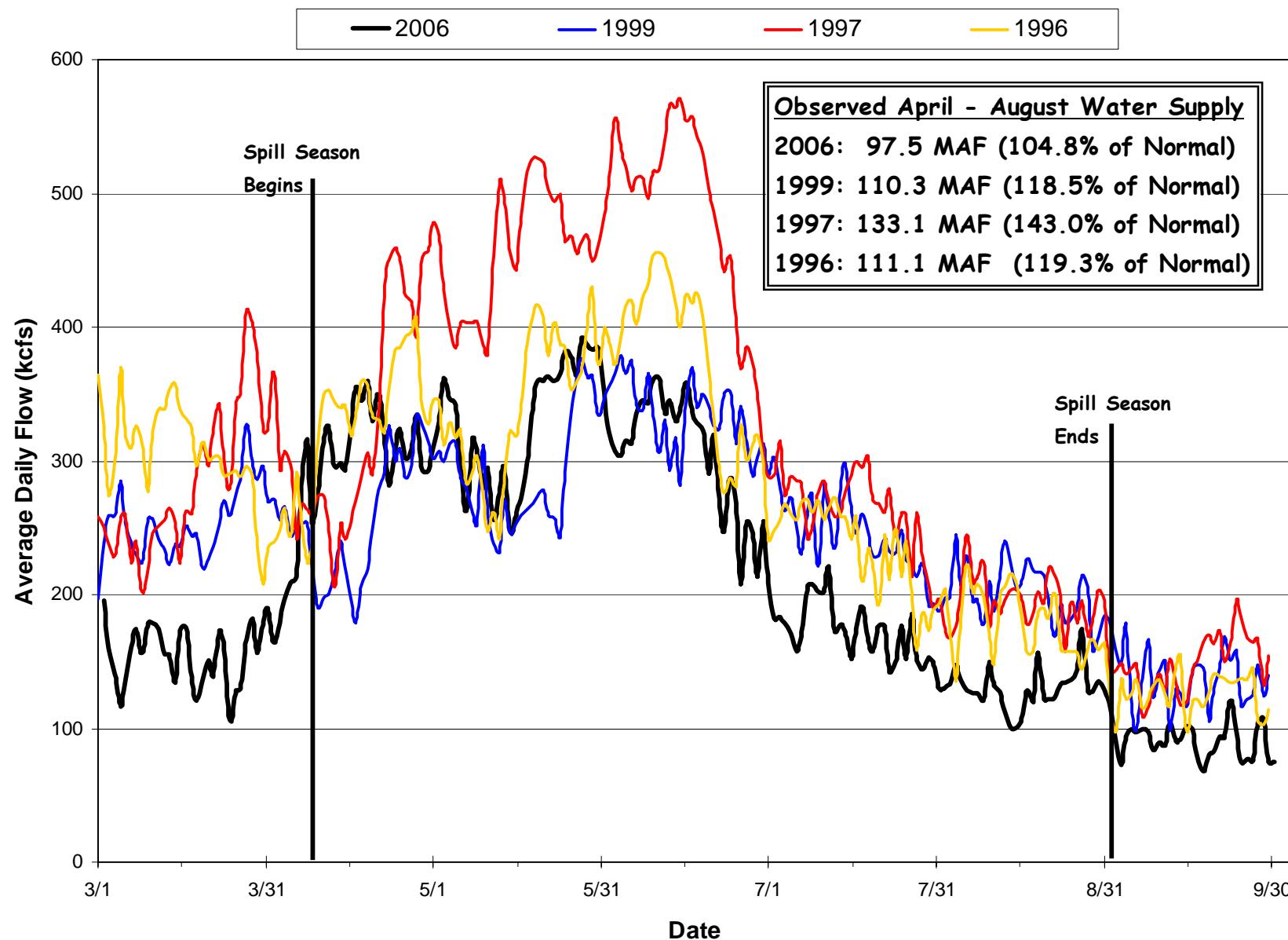
— 2002

— 1998

— 1995



Outflow Discharge - The Dalles Dam





Oregon and Washington TDG Criteria

- TDG shall not exceed 120% in the tailwaters of each project and 115% in the forebays of the next project upstream, as based on the highest 12 TDG readings in a single calendar day.
- TDG shall not exceed 125% on a one-hour basis (Washington) or a two-hour basis (Oregon).



TDG Management

- Spill program reviewed on a daily basis at Corps' Northwestern Division Office (Reservoir Control Center)
- Spill cap adjustments intended to keep TDG levels below State criteria during “Voluntary Spill”

2006 Snake River Fish Passage Spill

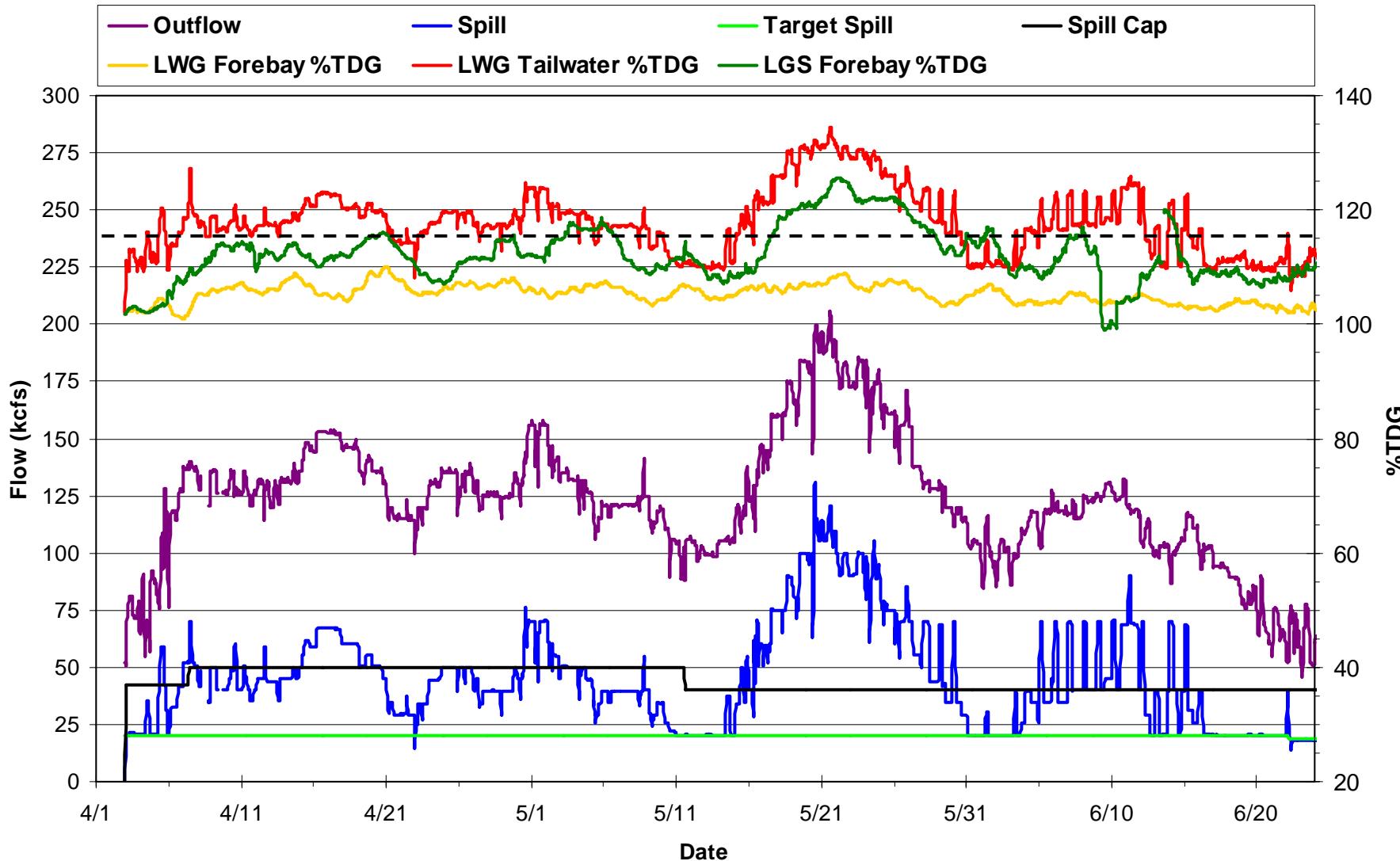
Project	Spring Operations [§] (3 April – 20 June)	Summer Operations [§] (21 June – 31 August)
Lower Granite	20 kcfs, 24 hrs/day (RSW Spill)	18 kcfs, 24 hrs/day (RSW Spill)
Little Goose	30% of Total Outflow, 24 hrs/day	30% of Total Outflow, 24 hrs/day
Lower Monumental	40 kcfs, 24 hrs/day	17 kcfs, 24 hrs/day
Ice Harbor	45 kcfs daytime/To spill cap at night [or] 30% of Total Outflow, 24 hrs per day (both treatments using RSW)	45 kcfs daytime/To spill cap at night [or] 30% of Total Outflow, 24 hrs per day (both treatments using RSW)

[§]Subject to TDG spill cap restrictions

RSW = Removable Spillway Weir.



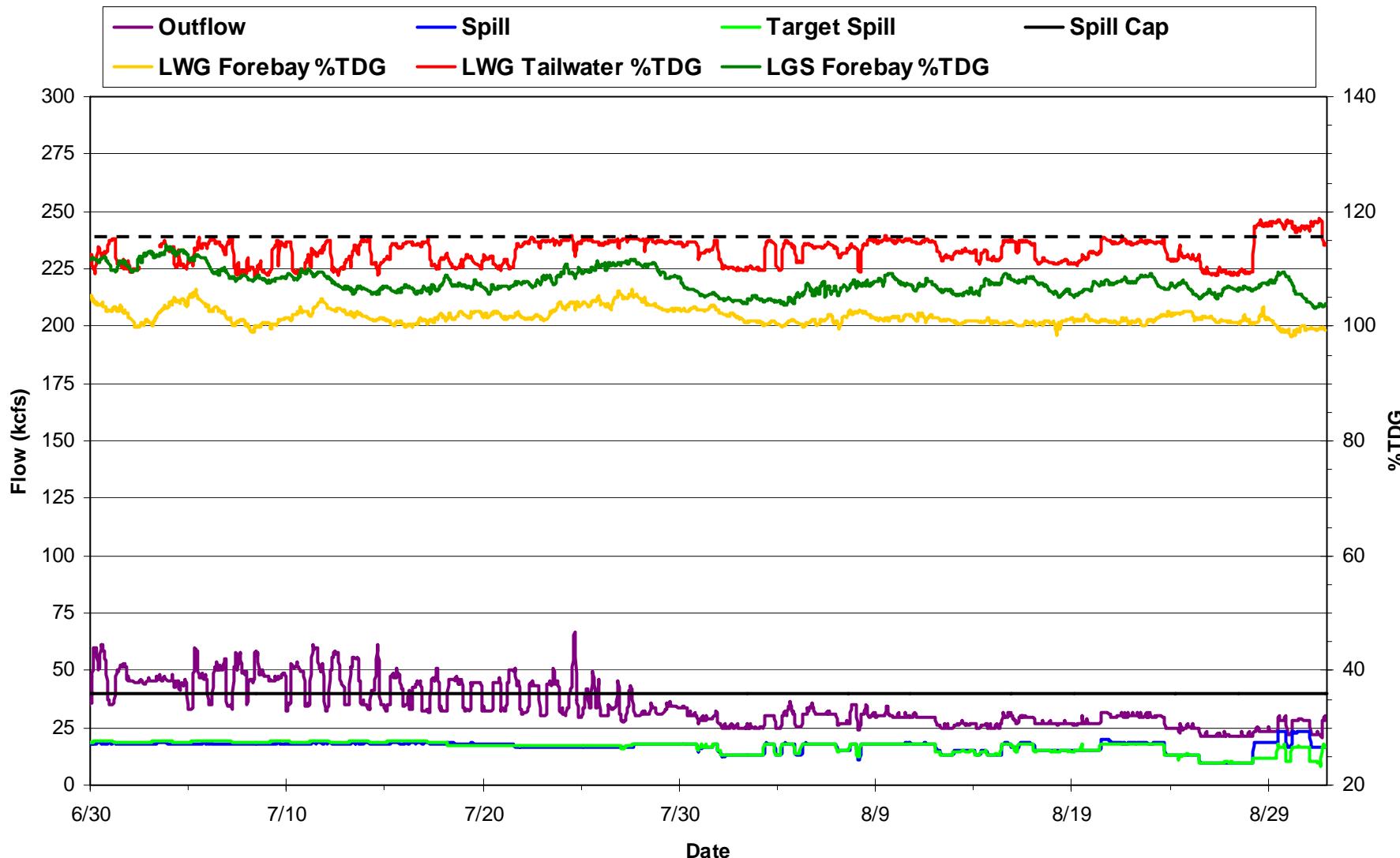
Spring Spill - Lower Granite Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

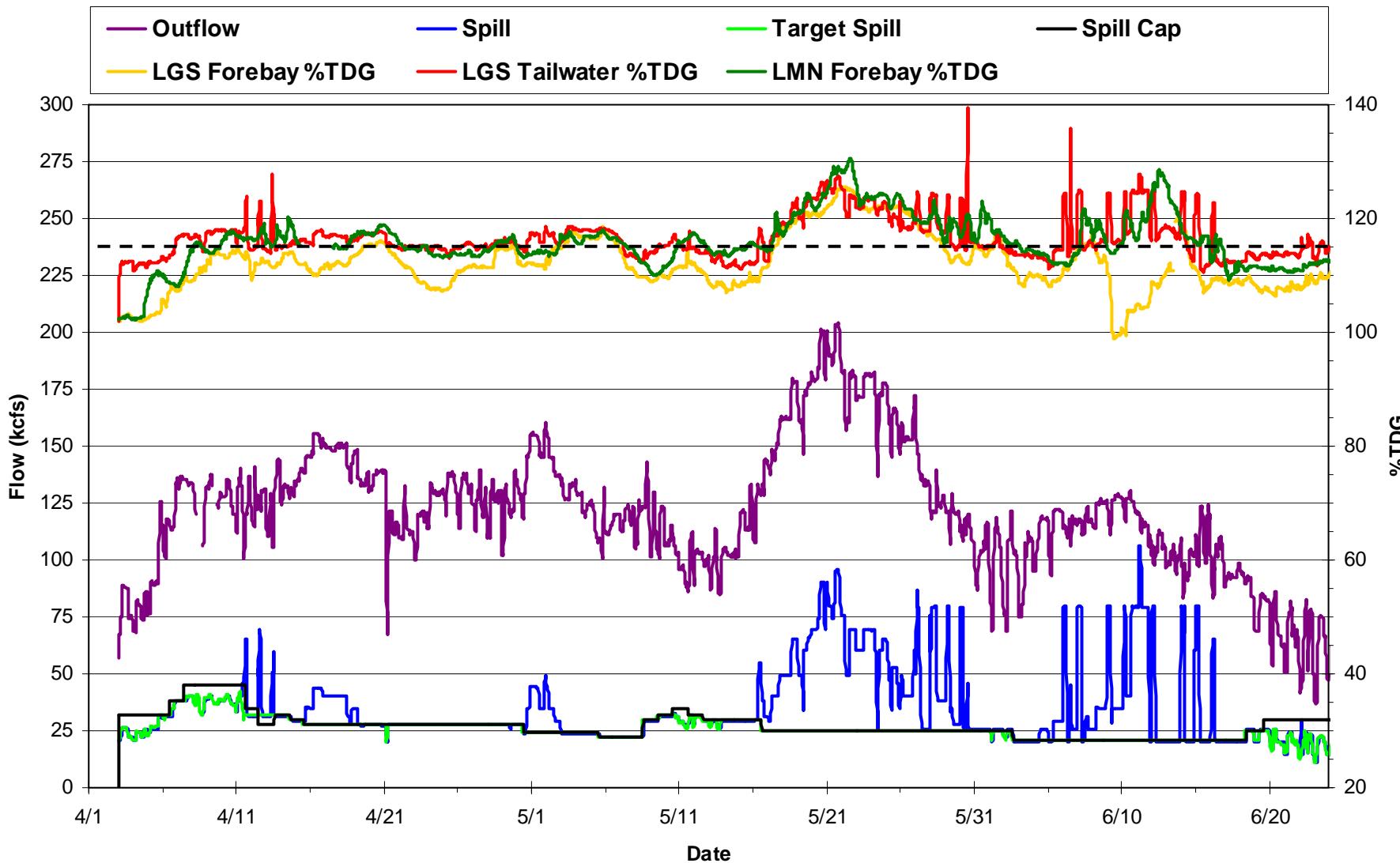
Summer Spill - Lower Granite Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

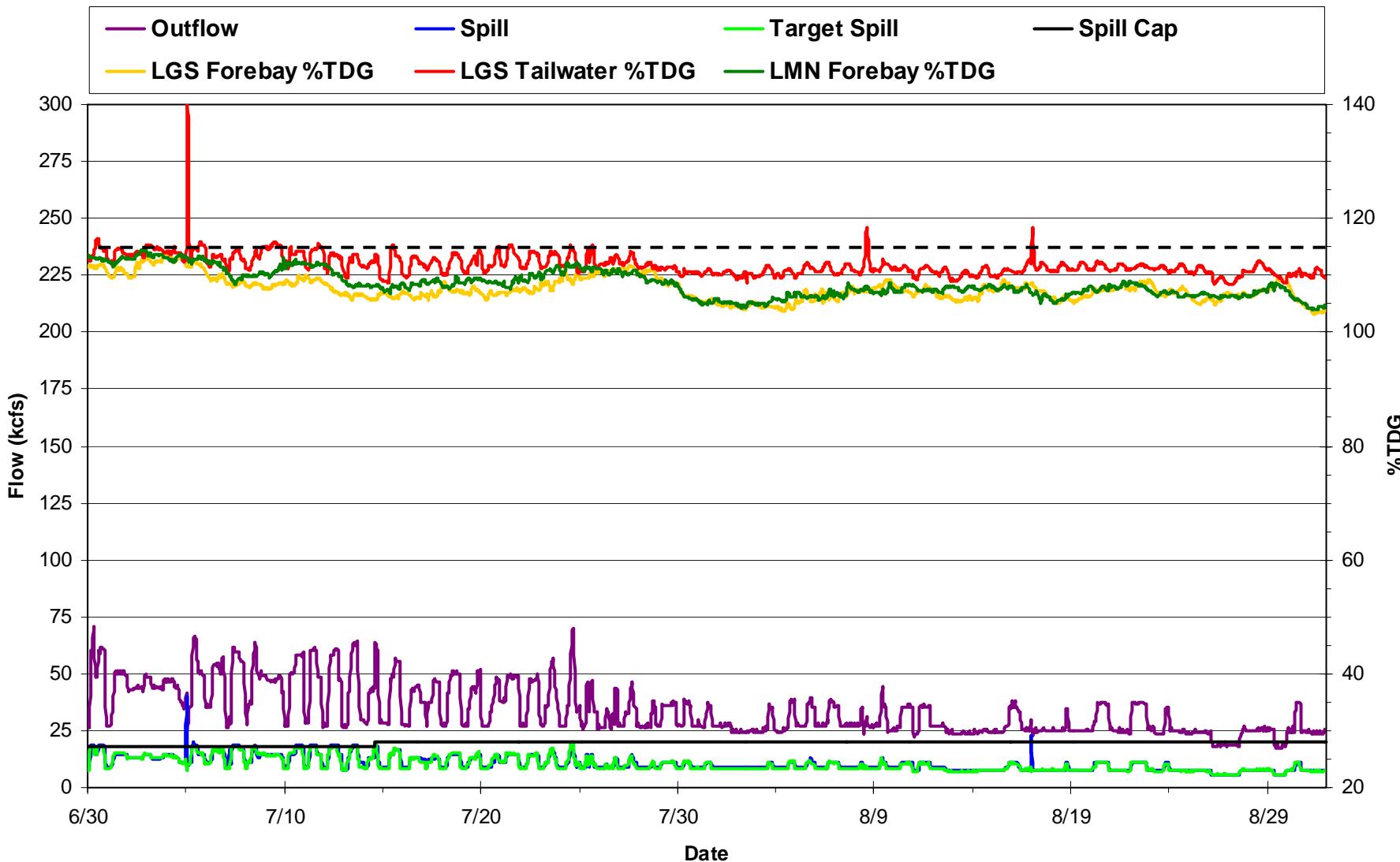
Spring Spill - Little Goose Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

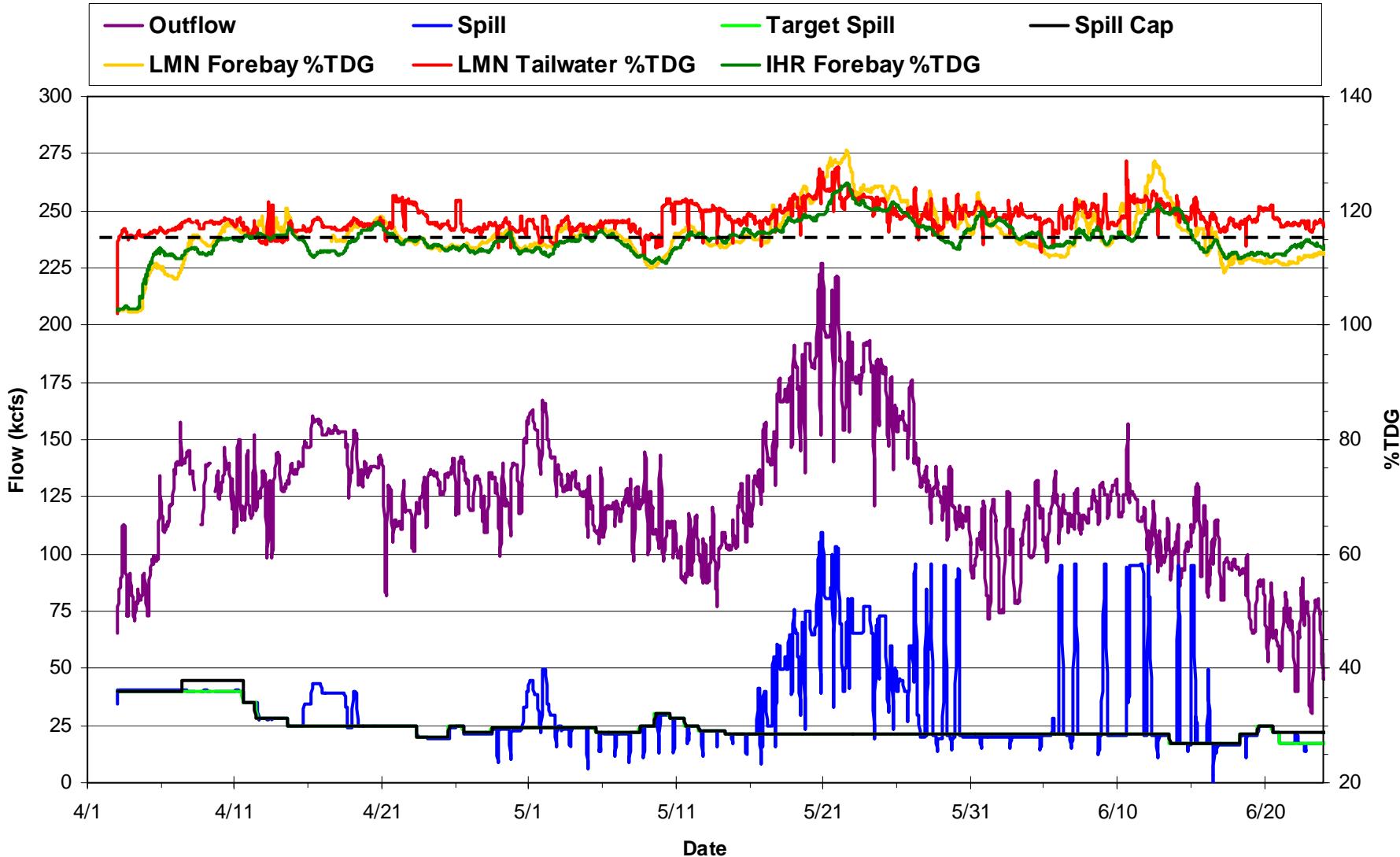
Spring Spill - Little Goose Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

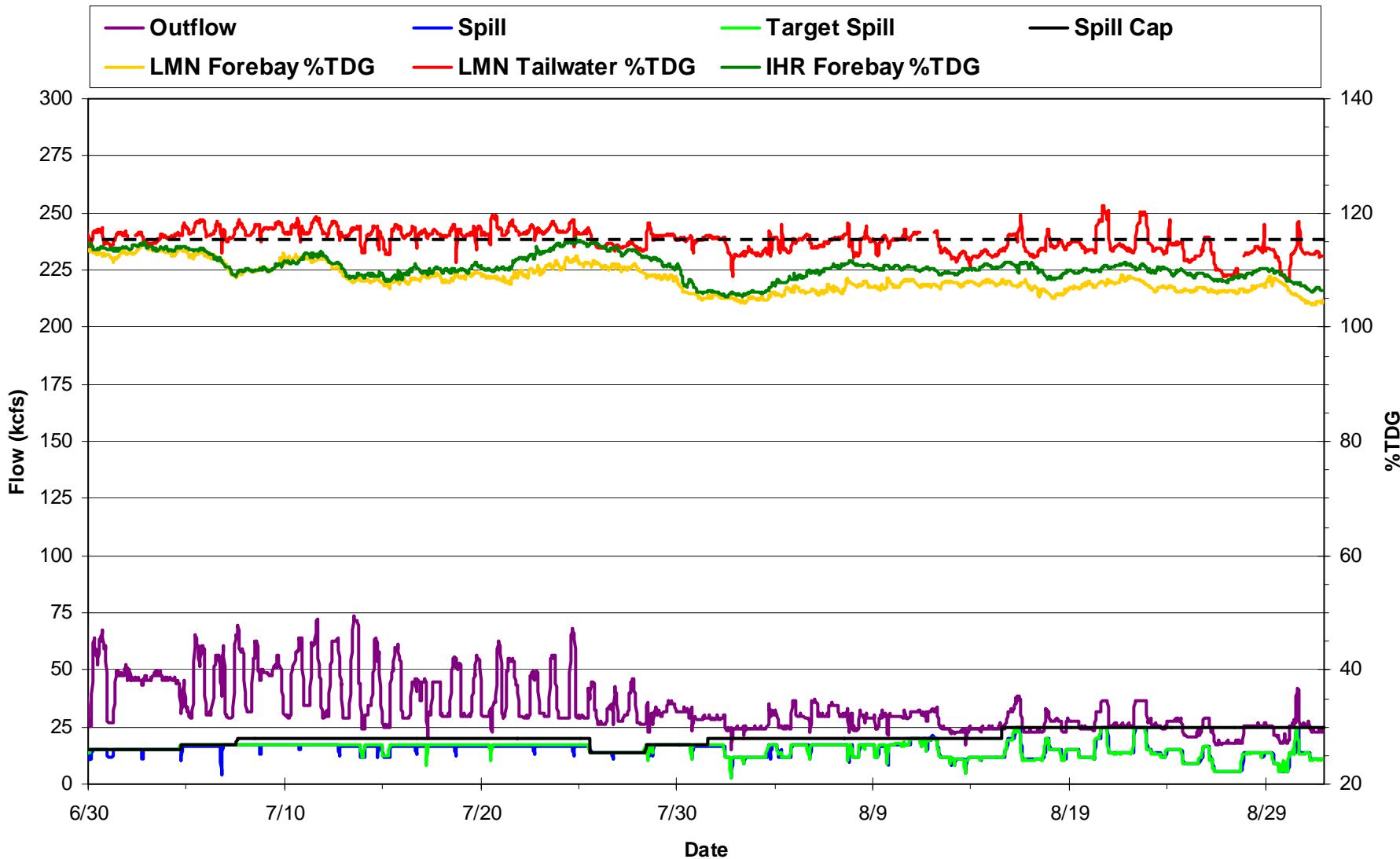
Spring Spill - Lower Monumental Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

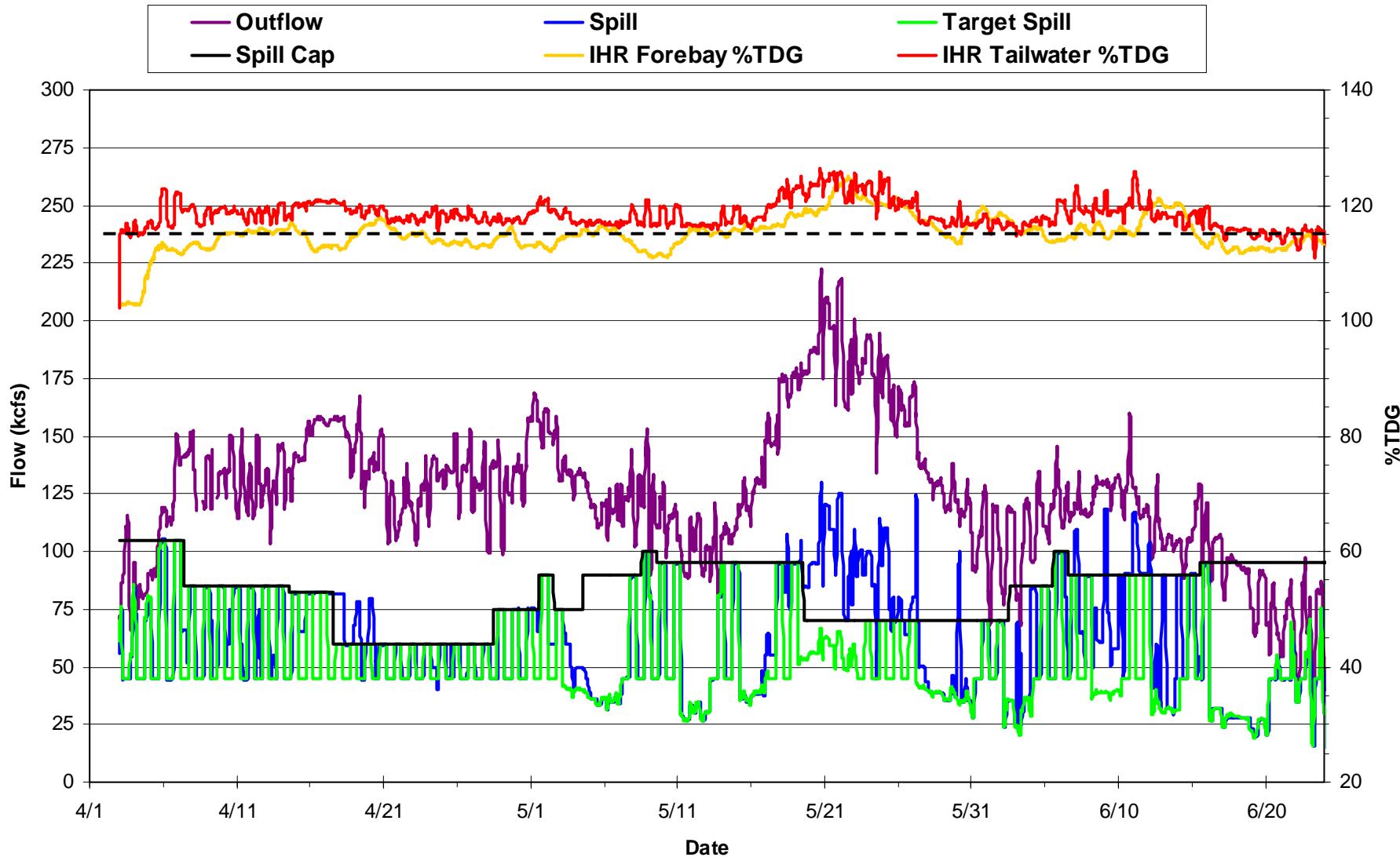
Spring Spill - Lower Monumental Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

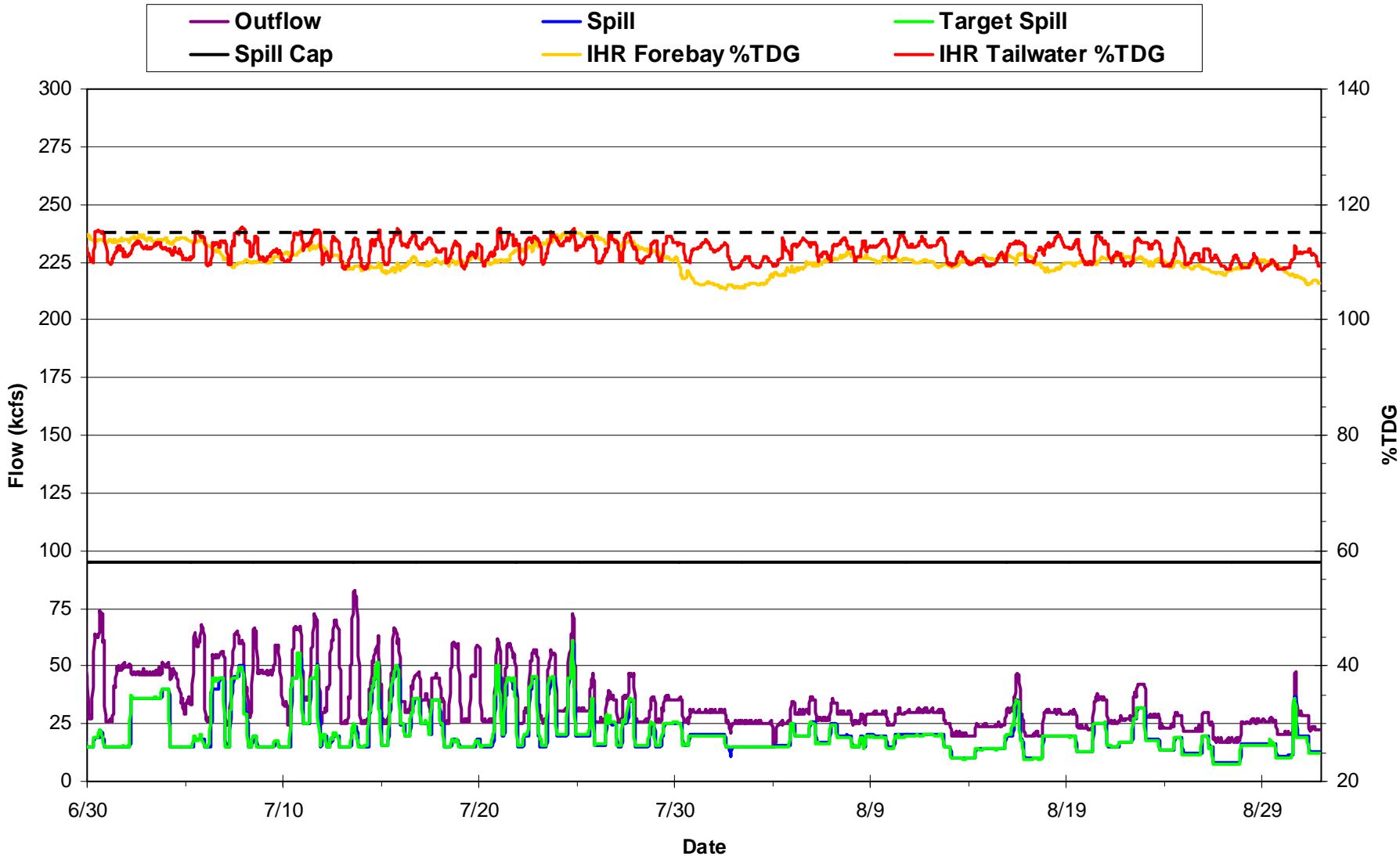
Spring Spill - Ice Harbor Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

Spring Spill - Ice Harbor Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.



Snake River TDG Statistics

TDG Monitoring Site	Location	Hourly High %TDG	Percentage of Hourly Readings Exceeding					# High 12-hr Average Exceedances
			<130	<125	<120	<115	<110	
Lower Granite Dam	Forebay	110.0	0.0	0.0	0.0	0.0	0.0	0
	Tailwater	134.5	2.5	5.9	15.5	44.3	90.1	28 (18.5%)
Little Goose Dam	Forebay	125.7	0.0	0.6	5.2	14.0	45.2	24 (15.9%)
	Tailwater	141.4	0.1	1.4	8.3	36.7	95.0	19 (12.6%)
Lower Monumental Dam	Forebay	130.6	0.1	2.1	8.6	31.2	65.1	55 (36.4%)
	Tailwater	128.8	0.0	0.6	14.3	79.0	98.1	29 (19.2%)
Ice Harbor Dam	Forebay	124.9	0.0	0.0	4.0	29.2	81.2	51 (33.8%)
	Tailwater	126.3	0.0	0.9	11.4	55.2	92.7	22 (14.6%)

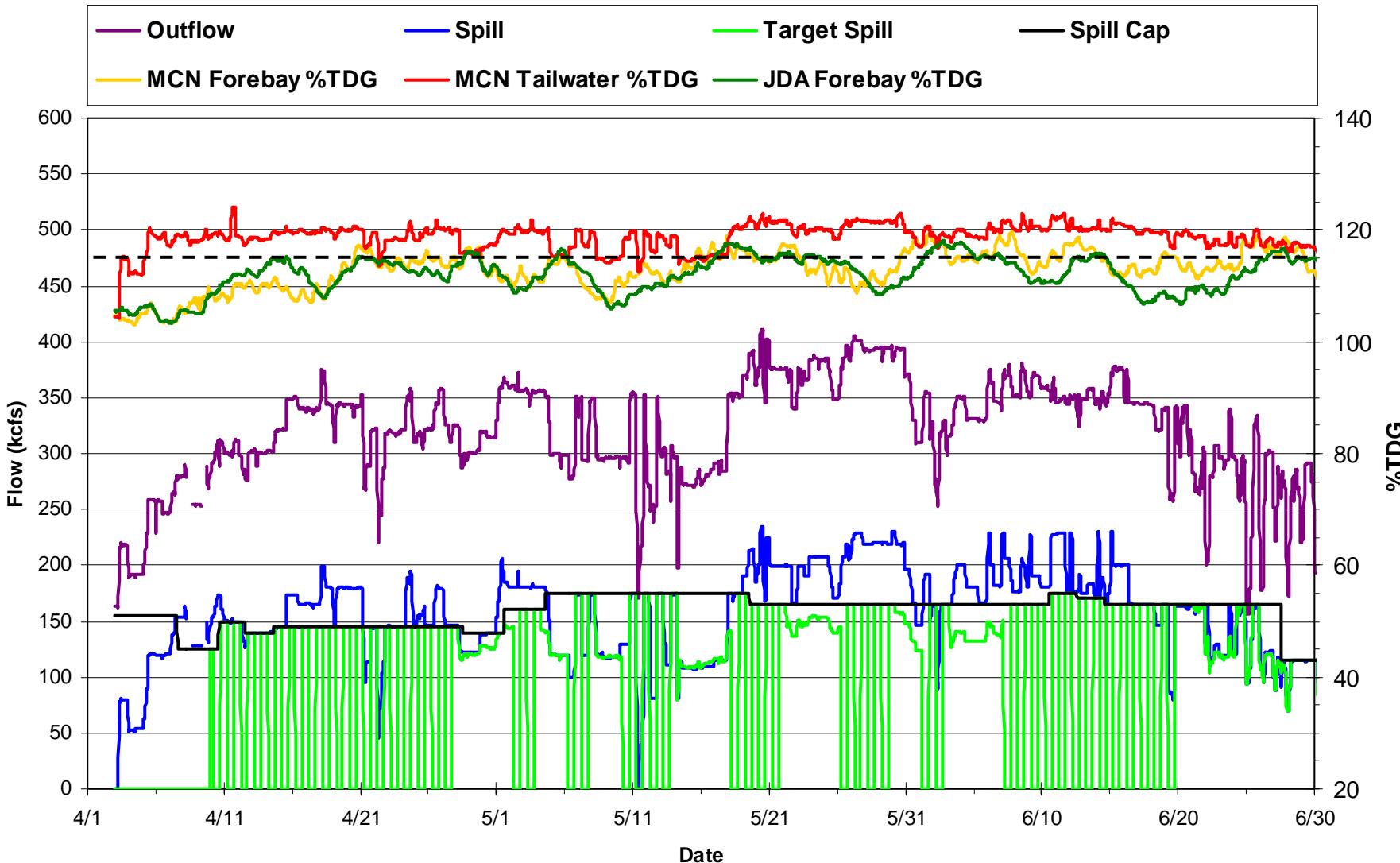
Columbia River Fish Passage Spill

Project	Spring Operations [§] (10 April – 30 June)	Summer Operations [§] (July 1 – 31 August)
McNary	0 kcfs daytime/To spill cap at night [or] 40% of total outflow, 24 hrs/day	40% of total outflow [or] 60% of total outflow, 24 hrs/day
John Day	0 kcfs daytime/60% of total outflow at night	30% of total outflow, 24 hrs/day
The Dalles	40% of total outflow, 24 hrs/day	40% of total outflow, 24 hrs/day
Bonneville	100 kcfs, 24 hrs/day	75 kcfs daytime/To spill cap at night

[§]Subject to TDG spill cap restrictions
RSW = Removable Spillway Weir.



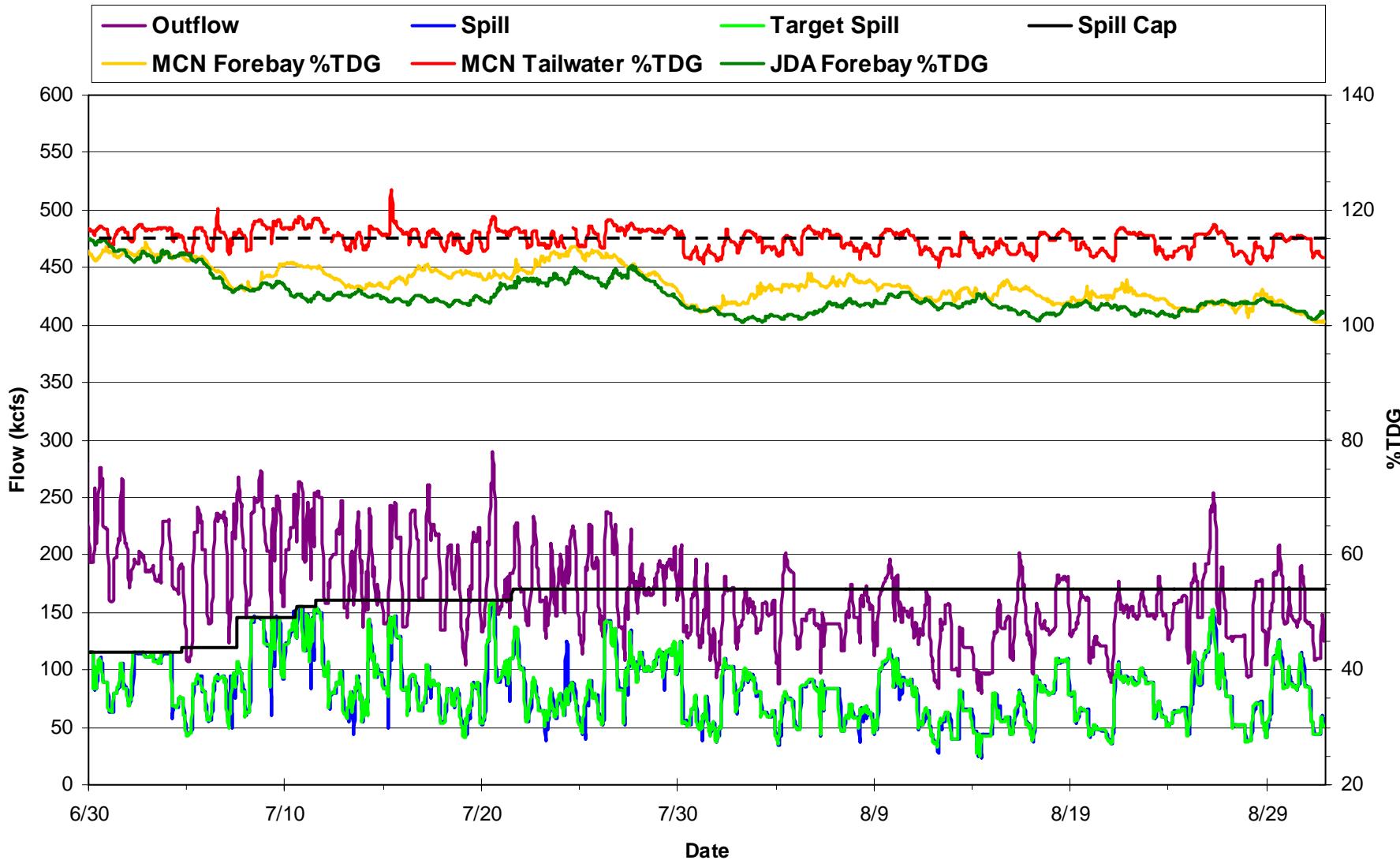
Spring Spill - McNary Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

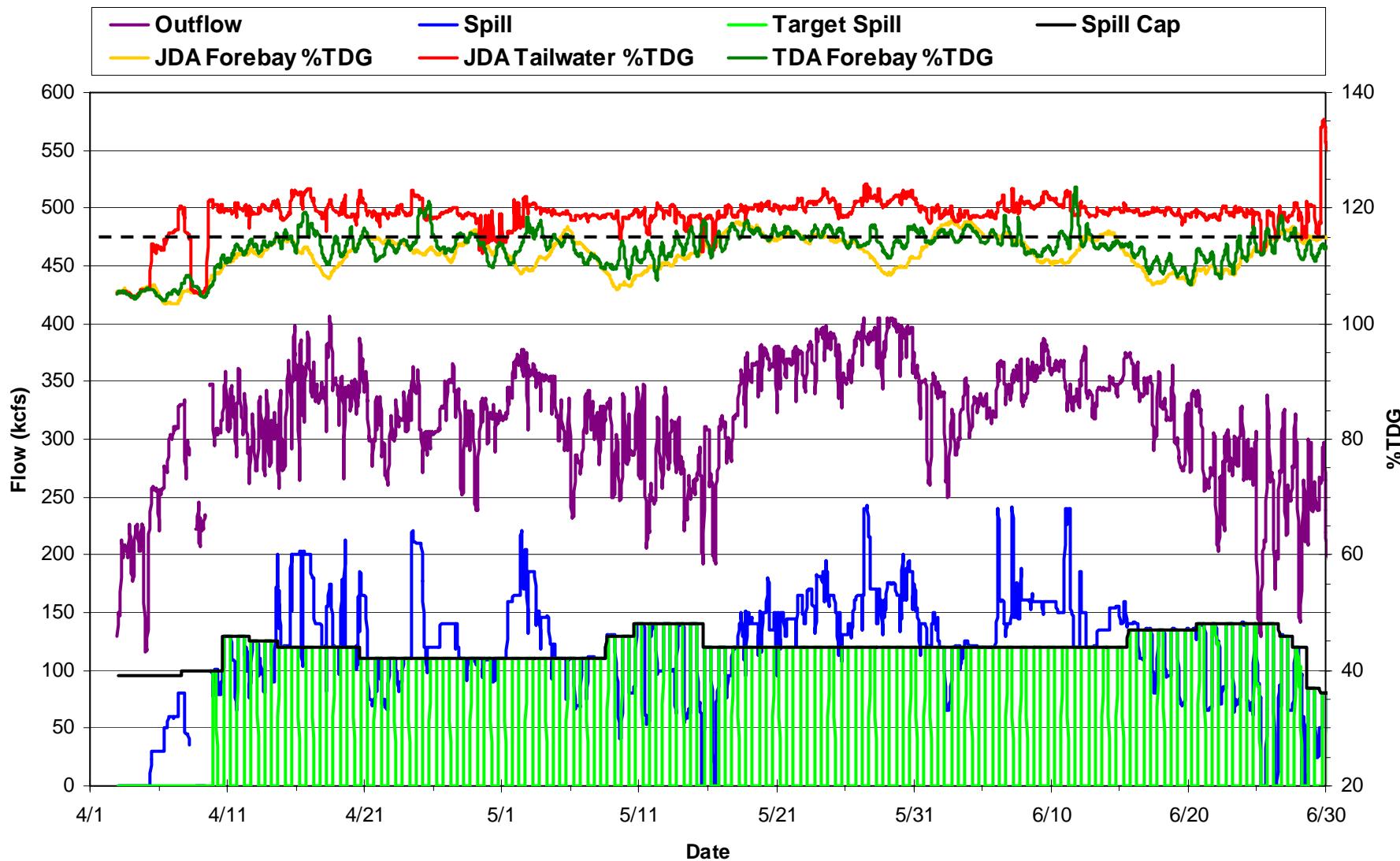
Summer Spill - McNary Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

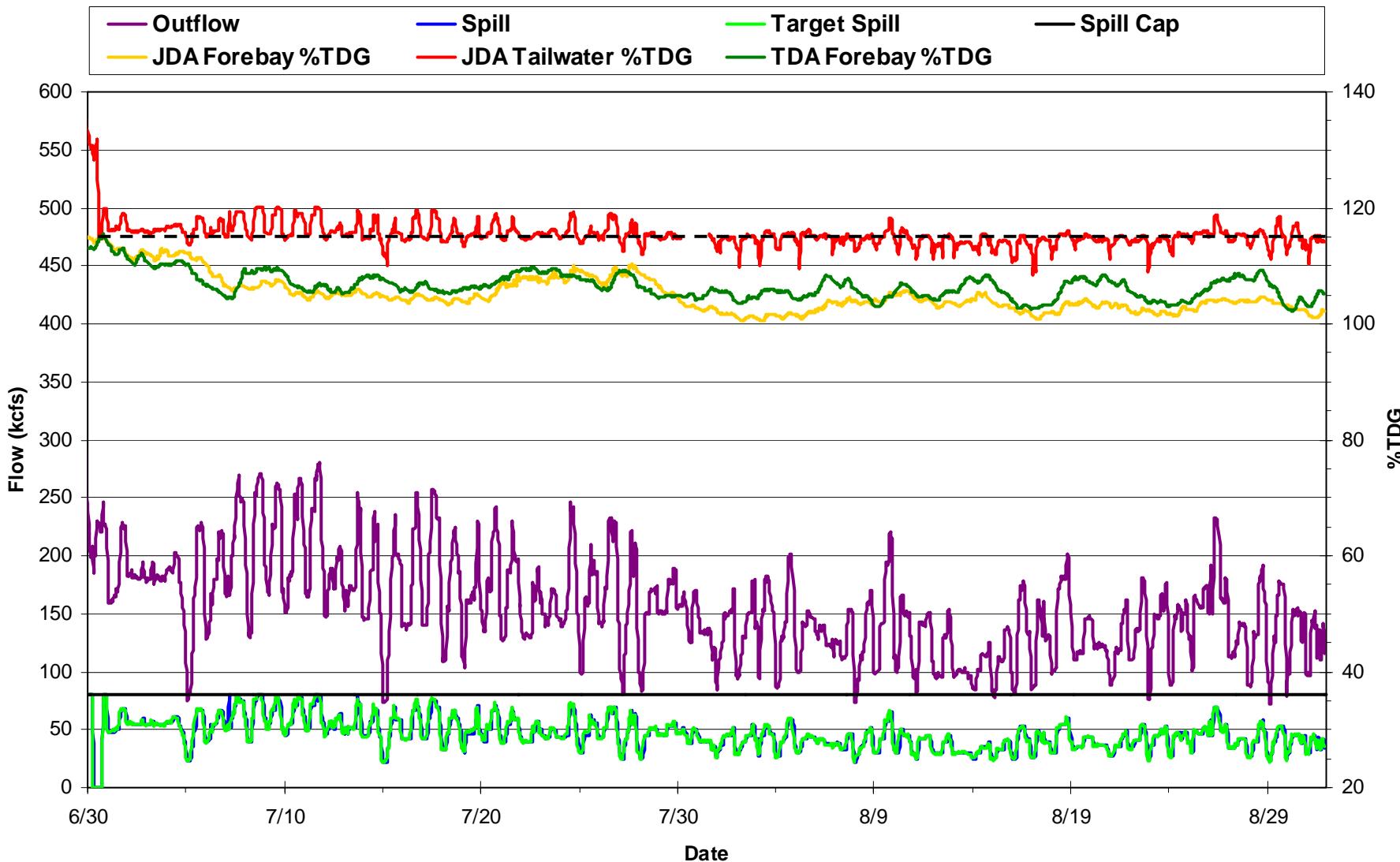
Spring Spill - John Day Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

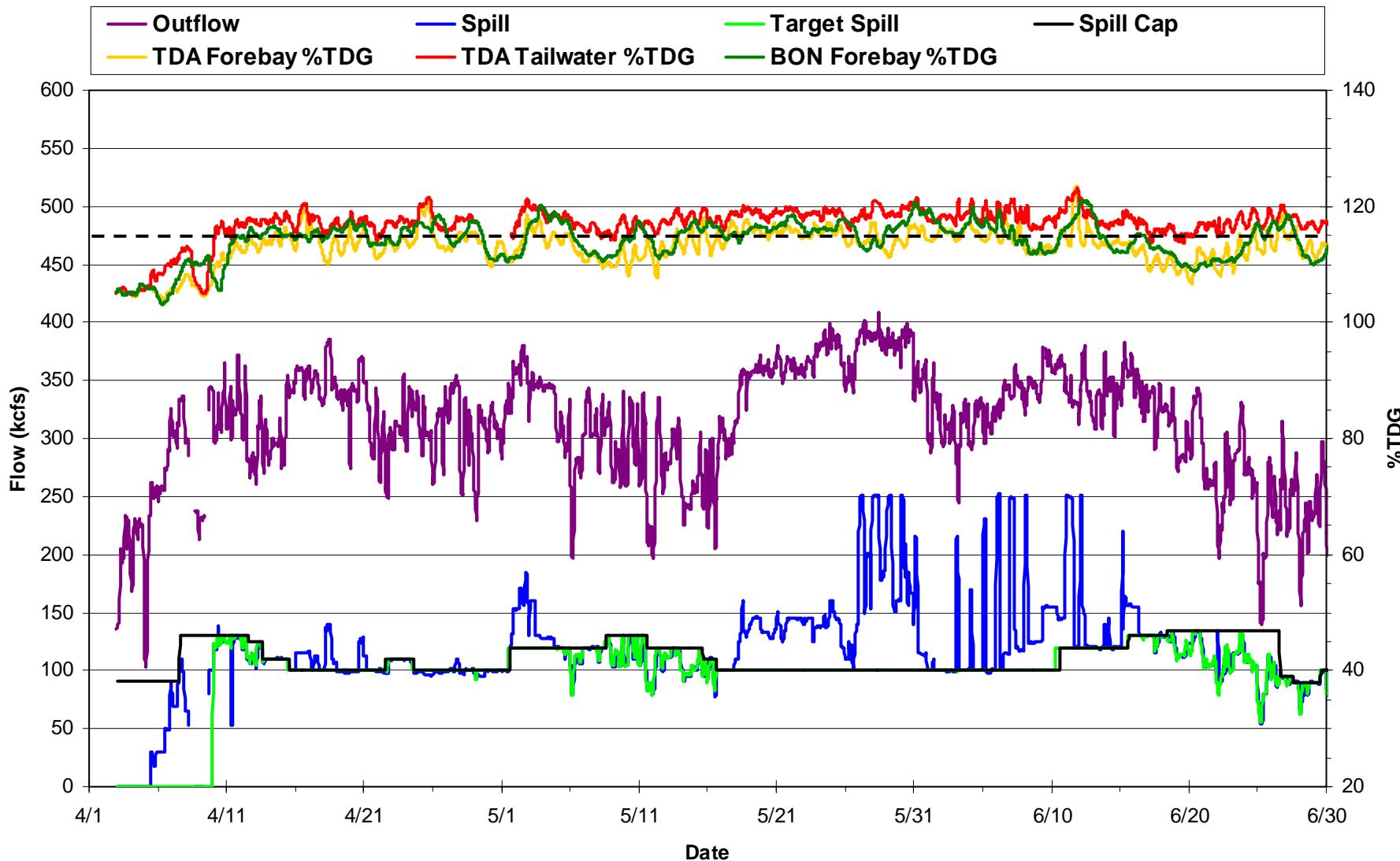
Summer Spill - John Day Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

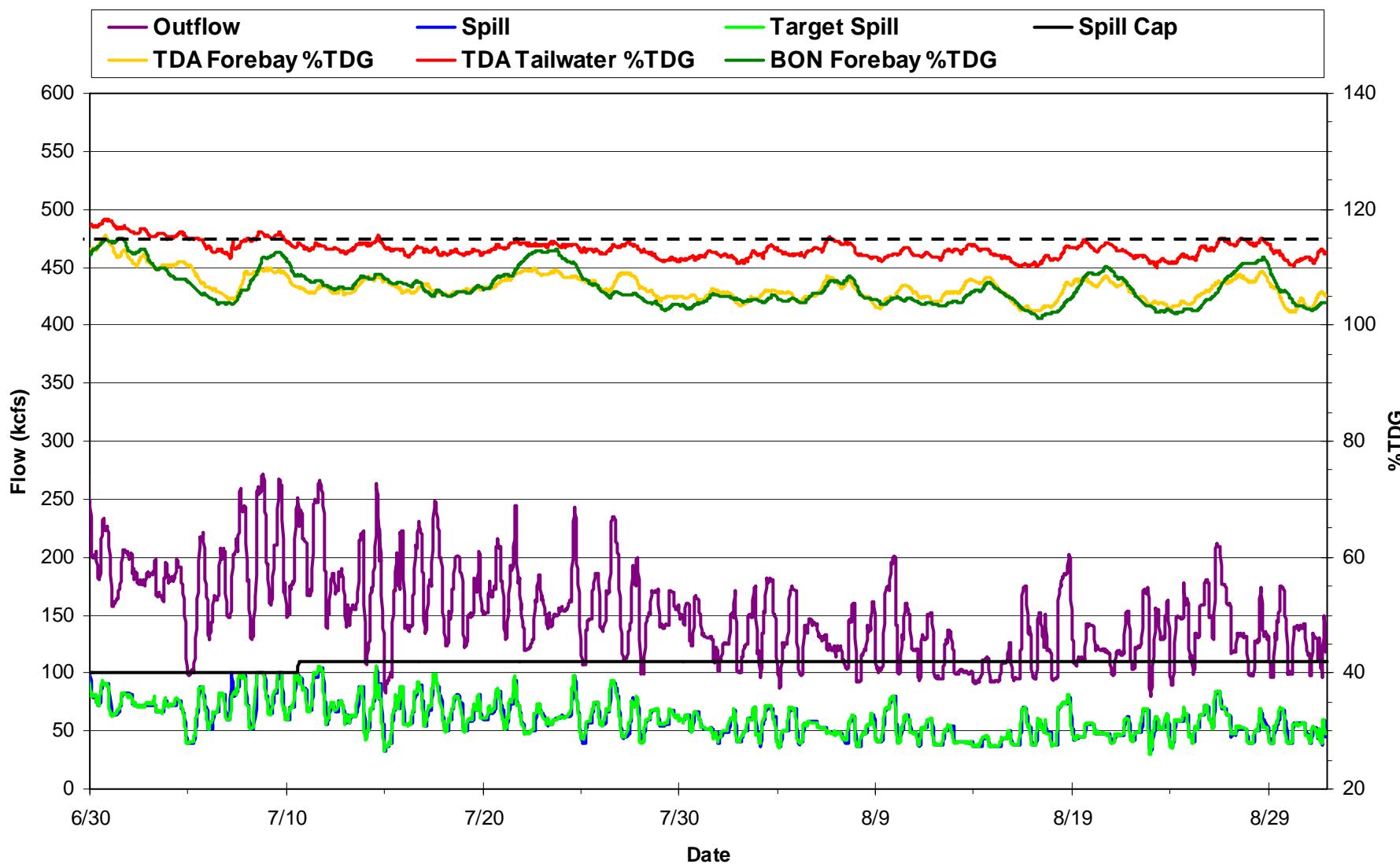
Spring Spill - The Dalles Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

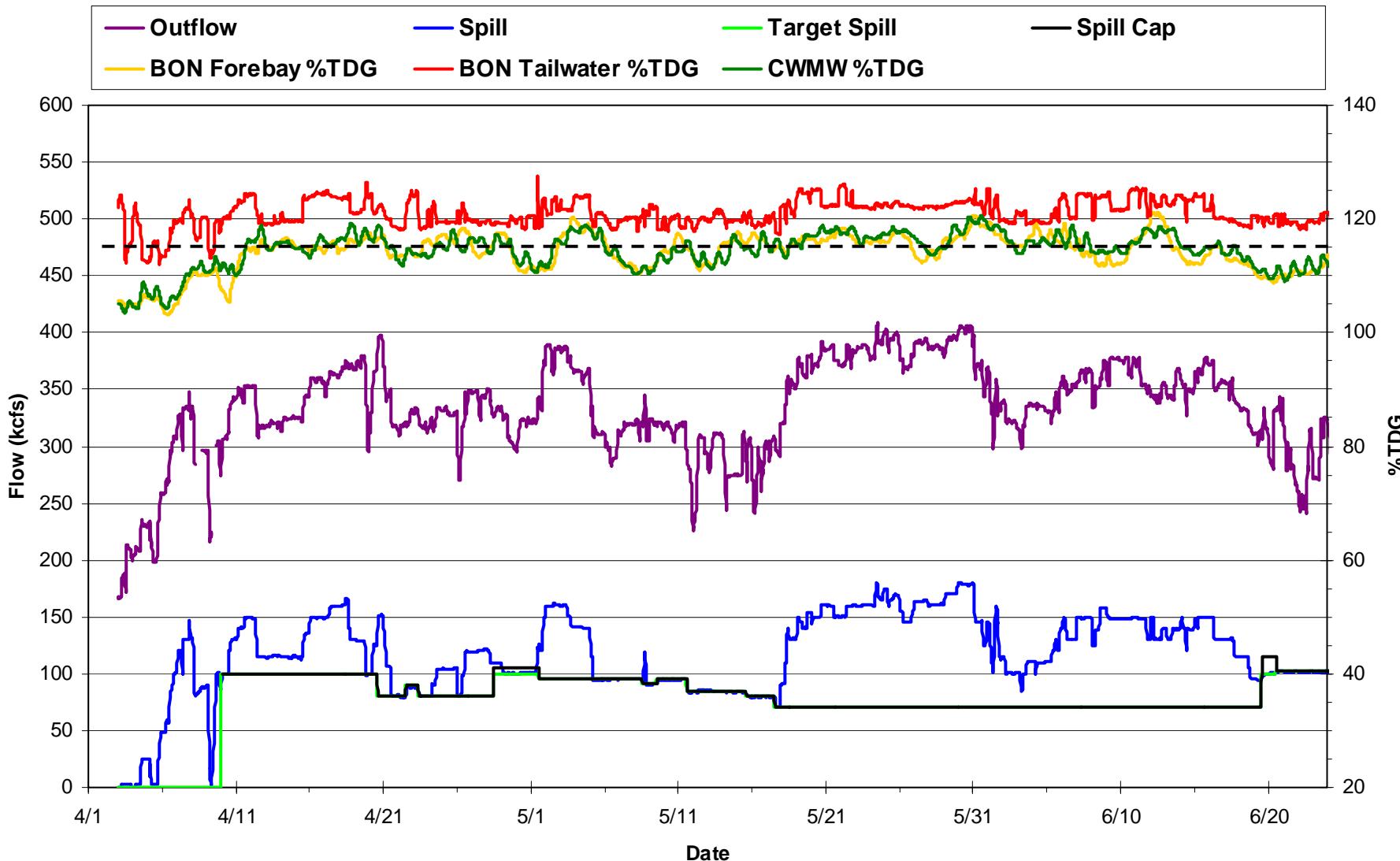
Summer Spill - The Dalles Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

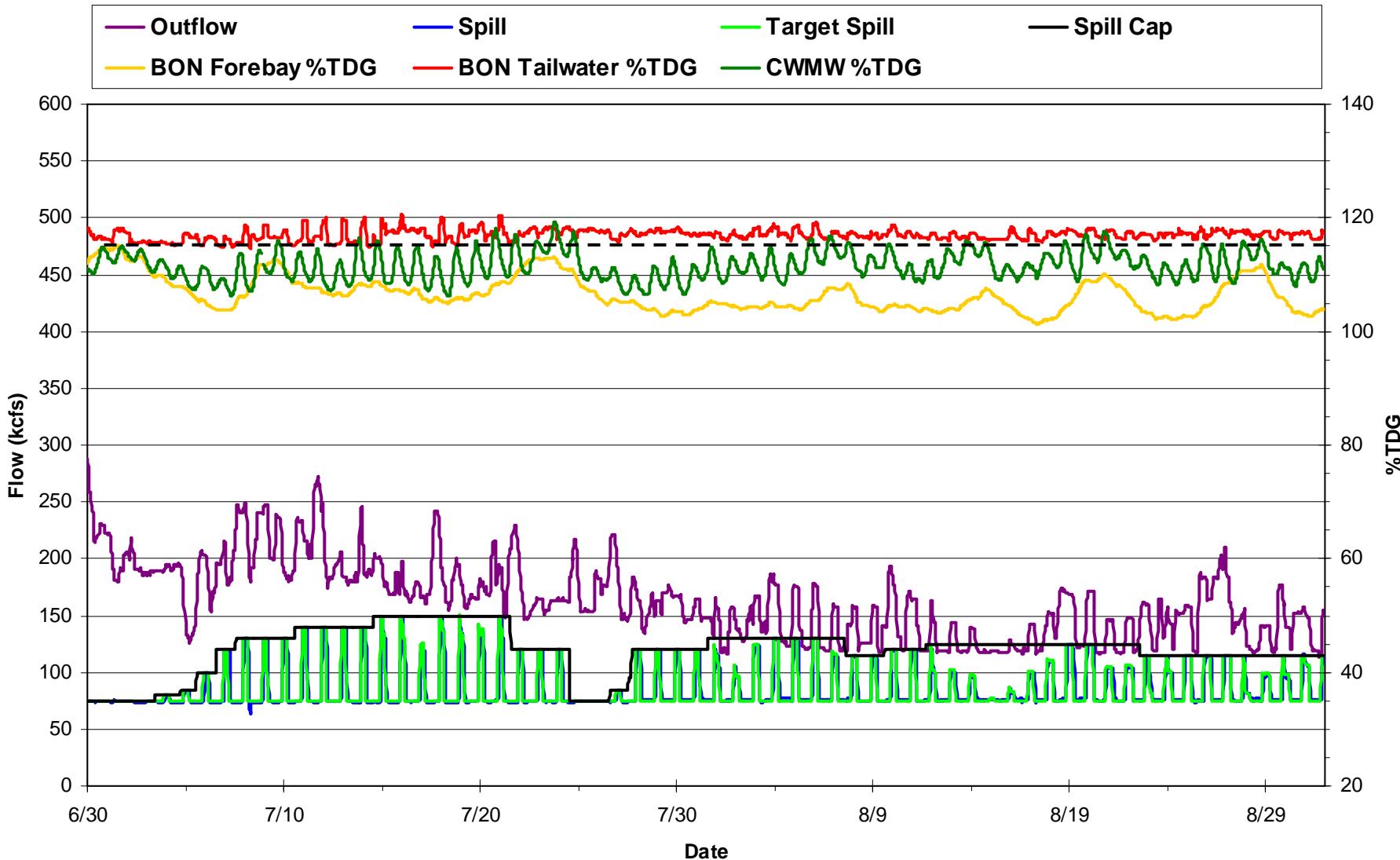
Spring Spill - Bonneville Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.

Summer Spill - Bonneville Dam



Target Spill = Quantity of Spill specified in the Fish Passage Implementation Plan.

Spill Cap = Maximum amount of spill that will keep TDG levels below State TDG Criteria.



Columbia River TDG Statistics

TDG Monitoring Site	Location	Hourly High %TDG	Percentage of Hourly Readings Exceeding					# High 12-hr Average Exceedances
			<130	<125	<120	<115	<110	
McNary Dam	Forebay	119.8	0.0	0.0	0.0	17.2	56.2	31 (21.5%)
	Tailwater	124.1	0.0	0.0	16.6	76.8	99.4	32 (22.2%)
John Day Dam	Forebay	118.1	0.0	0.0	0.0	10.9	46.3	20 (13.9%)
	Tailwater	135.4	0.4	0.6	18.5	76.1	96.5	41 (28.5%)
The Dalles Dam	Forebay	123.6	0.0	0.0	0.4	16.1	53.3	40 (27.7%)
	Tailwater	123.1	0.0	0.0	3.5	54.5	94.8	9 (6.3%)
Bonneville Dam	Forebay	121.1	0.0	0.0	0.9	28.2	59.1	50 (34.7%)
	Tailwater	127.5	0.0	1.8	34.5	98.5	100.0	67 (46.5%)
	CWMW	120.5	0.0	0.0	0.3	32.6	83.3	63 (43.8%)

Historic TDG Exceedances

AVERAGE HIGH 12 HR %TDG EXCEEDANCES AT FMS FROM 1999 - 2005

	2006	2005	2004	2003	2002	2001	2000	1999	Totals
Water Quality Gages	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.
Lower Granite Forebay *	0	0	0	0	0	5	2	0	7
Lower Granite Tailwater	28	0	0	15	17	0	4	15	79
Little Goose Forebay *	24	0	3	10	17	0	2	39	95
Little Goose Tailwater	19	0	0	6	6	0	9	6	46
Lower Monumental Forebay *	55	6	1	19	49	0	28	44	202
Lower Monumental Tailwater	29	7	1	10	6	0	12	26	91
Ice Harbor Forebay *	51	3	4	35	24	0	34	44	195
Ice Harbor Tailwater	22	3	2	4	6	0	4	12	53
McNary Forebay - Wa. *	31	8	10	24	43	1	14	22	153
McNary Forebay - Or.	--	11	23	32	45	5	22	19	157
McNary Tailwater	32	1	7	12	31	0	17	50	150
John Day Forebay	20	2	0	10	11	0	1	8	52
John Day Tailwater	41	3	0	0	29	0	12	43	128
The Dalles Forebay	40	6	5	11	18	0	5	1	86
The Dalles Tailwater	9	0	0	4	11	0	5	5	34
Bonneville Forebay	50	3	1	17	30	0	14	19	134
Cascade Island	67	0	---	---	---	---	---	---	67
Warrendale	--	---	0	1	19	0	6	2	28
Camas/Washougal	63	16	14	33	65	2	58	51	302
Total Number of Exceedances	581	69	71	243	427	13	249	406	2059

* Forebay gauges lowered from 5 to 15 meters in depth before start of 2005 spill season.



Observed Water Supply Volumes

Year	Lower Granite Dam		The Dalles Dam	
	April – July Runoff MAF	% of Normal	April – August Runoff MAF	% of Normal
1995	20.98	97.32	86.09	92.48
1996	28.11	130.42	111.08	119.33
1997	33.53	155.56	133.13	143.02
1998	23.67	109.82	90.09	96.79
1999	25.78	119.59	110.34	118.53
2000	17.16	79.63	84.27	90.53
2001	10.30	47.78	52.79	56.71
2002	19.02	88.24	93.80	100.77
2003	16.73	77.64	73.77	79.25
2004	15.03	69.71	72.96	78.38
2005	13.49	62.6	68.45	73.54
2006	24.44	113.38	97.54	104.79

MAF = Million Acre-Feet



Discussion